# CREEPING WOODSORREL AND BERMUDA BUTTERCUP

*Integrated Pest Management for Home Gardeners and Landscape Professionals*

Creeping woodsorrel, *Oxalis corniculata*, is a weed species that occurs in many parts of the world. In California it usually grows below the 2,500-foot elevation level and frequently appears in lawns, flower beds, gardens, nurseries, and greenhouses.

A related species, Bermuda buttercup, *O. pes-caprae*, is a South African native that grows in California's coastal gardens and fields as well as inland landscaped areas. Bermuda buttercup, also called Buttercup oxalis, has been cultivated as an ornamental, and although you'll occasionally find it in lawns, more often it is a problem in flowerbeds, groundcovers, and shrub areas in home landscapes or in commercial, field-grown flowers. In recent years it has been encroaching in natural areas and hillside plantings along California's coast.

The genus name *Oxalis* is derived from the Greek word meaning "sour," referring to the sour-tasting oxalic acid present throughout the plants. If livestock ingest large quantities, they can suffer from oxalate poisoning.

## IDENTIFICATION AND LIFE CYCLE

### *Creeping Woodsorrel*

A perennial plant that lives for several seasons, creeping woodsorrel (Fig. 1) grows in a prostrate manner (low and creeping) and forms roots and stems where nodes contact the soil. It grows in both full sun and shade if the area receives adequate moisture.

The leaves are comprised of 3 heart-shaped leaflets attached to the tip of a long stem. Leaves are green to purple (Fig. 2) and often close and fold downward in intense light and at night (Fig. 3). If creeping woodsorrel plants are stressed due to drought or intense heat, the leaves sometimes turn reddish and wilt.

Creeping woodsorrel can bloom almost any time during the year, although spring is a time of heavy flowering and seed formation. The flowers have 5 small, yellow petals about 1/8- to 1/3-inch long that are borne singly in small clusters of 2 to 5 flowers on the ends of short, slender stalks.

Seedpods are erect, hairy, cylindrical capsules with a pointed tip about 1/3 to 1 inch long and resemble miniature okra. Seeds are oval, flat, rough, reddish brown sometimes with gray spots, and about 1/25 inch long. There are about 10 to 50 seeds per pod, with a potential for more than 5,000 seeds per plant. When seedpods mature, they rupture, and seeds are forcefully expelled, landing up to 10 feet from the plant. Because seeds are rough, they can stick to machinery, plastic pots, irrigation tubing, and clothing.

Seeds require light for germination. Optimum seed germination occurs between 60° and 80°F, although it can occur at lower temperatures. Seeds can germinate any time of year in California, but most plant establishment takes place in fall. It isn't known how long seeds remain viable in the soil. Moist, hot conditions inhibit seed germination; for example, 4 hours of moist heat at 97°F decreases germination by 96%, while 8 hours stops it altogether.

Seedlings have 2 round leaves, and the first true leaves are a replica of the mature, heart-shaped leaflets. Creeping woodsorrel grows rapidly, forming a fleshy taproot and an extensive root system that expands outward. Seedlings begin flowering in about 4 weeks. Extremely cold or hot temperatures reduce growth but won't kill the plants. If you pull creeping woodsorrel from the ground, the taproot or stolons often break off and remain in the soil, allowing the plant to regrow. Pieces of roots and prostrate stems can develop into new plants when conditions are favorable.

**Figure 1. Creeping woodsorrel.**

**Figure 2. A variant of creeping woodsorrel, *O. corniculata* variety atropurpurea, has purple leaves.**

**Figure 3. Under intense sunlight, creeping woodsorrel plants often fold their leaves downward.**


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### *Bermuda Buttercup (Buttercup Oxalis)*

Bermuda buttercup (Fig. 4) is a perennial that grows in full sun in cool coastal areas, but inland it grows primarily in semishaded sites. It grows upright and is larger and showier than creeping woodsorrel.

It develops from bulbs that sprout and grow in the fall. The plant forms a single, short, vertical stem that is mostly underground. Leaves form a loose basal rosette on the soil surface. The leaves are comprised of 3 heart-shaped leaflets and are larger and more succulent than those of creeping woodsorrel; they often are spotted with purple dots.

Small, whitish bulblets develop on the stem at the base of the rosette of leaves, and new bulbs form underground (Fig. 5). A plant forms about a dozen small bulbs per year, each less than 1 inch long. Bermuda buttercup also can produce a lateral stem (runner) that forms a new, aboveground plant.

Flowers appear in late winter or early spring. The flowers are bright yellow, 3/4 to 1 1/2 inches in diameter, and are borne on top of a leafless stalk rising 6 to 12 inches tall. Viable seed never has been documented in California, and rarely has it been seen anywhere else in world. Foliage dies and the bulbs become dormant when temperatures rise in late spring and summer. Bermuda buttercup reproduces vegetatively by bulbs and spreads when plants are divided or soil containing the bulbs is moved to uninfested areas.

## IMPACT

### *Creeping Woodsorrel*

Creeping woodsorrel is a major weed in turf, ornamental plantings, and nurseries. Infested container stock can contaminate uninfested landscapes. As seedpods mature and expel seeds, creeping woodsorrel spreads from container to container, from flower bed to flower bed, or across ornamental plantings. Creeping woodsorrel can establish rapidly in semishaded areas of new or established grass lawns or low-growing perennial ground covers. It spreads during mowing and other cultural operations.

Once established, it is very competitive, because it grows year-round. This makes it particularly troublesome in warm season turf species such as bermudagrass or perennial groundcovers that have a dormancy period.

### *Bermuda Buttercup (Buttercup Oxalis)*

Bermuda buttercup used to be grown as an ornamental, but once planted it would spread throughout a garden, compete with other plants, and become very difficult to control. It still is plentiful in many landscapes. Although it can spread into the edges of turfgrass, mowing reduces its invasiveness, so it rarely is a problem in lawns. It is a major problem in field-grown flowers and in the home landscape, especially in groundcovers.

Bermuda buttercup was first noted in California in the San Francisco Bay region and has since spread throughout most coastal counties, the coastal range, and into the Central Valley. In the last 10 years, this plant has invaded native coastal dunes and natural areas along the coast, leading to the demise of native plants. It is a troublesome weed that is more competitive than is assumed from its general appearance.

Due to its extensive occurrence in yards and gardens, Bermuda buttercup has the potential to rapidly spread via the production of bulbs and the movement of contaminated soils into adjacent natural areas. Because it is practically impossible to eradicate infested soils of this weed, take care to prevent Bermuda buttercup from invading wildlands.

## MANAGEMENT

In many garden situations creeping woodsorrel and Bermuda buttercup can be managed with physical control methods such as handweeding. In other cases, herbicides can be integrated into the management program;

**Figure 4. Bermuda buttercup.**

**Figure 5. Bermuda buttercup bulbs.**

see Tables 1 and 2. The effectiveness of control method depends on which weed is present and where the weeds are growing.

**Creeping woodsorrel.** The two primary methods for managing creeping woodsorrel are removing established plants and controlling germinating seeds. You can control established plants with handweeding, hand cultivation with hoes and weeding tools, and postemergent herbicides. Try to control plants before they flower and set seed. Infested sites require constant vigilance and continuous weed removal.

Control seedlings by preventing seed germination and/or seedling emergence with preemergent herbicides and/or mulches along with continual handweeding. Burying seeds or covering them with mulch to block their exposure to light prevents germination and is an effective way to control seedlings in planting beds; it isn't a feasible method for lawns. Preemergent herbicides can be used to prevent seedling emergence in most sites where creeping woodsorrel grows. Both pre- and postemergent herbicide selection is dependent upon the site of infestation.

**Bermuda buttercup (Buttercup oxalis).** Bermuda buttercup grows mostly in ornamental beds, where control is difficult and complicated by the presence of ornamental plants. Removing the top of the plant by cultivating or cutting it off won't kill the bulb. Don't move soil from an infested site to one that is free of the weed. Handweeding is used extensively to reduce infestations, but because it is exceedingly difficult to remove all of the bulbs, new plants usually appear. Bermuda buttercup isn't a common problem in lawns.

## *Creeping Woodsorrel in Turfgrass*

Mowing, fertilizing, or irrigating to control creeping woodsorrel isn't effective; the more vigorous the turfgrass, the more vigorous the creeping woodsorrel. Creeping woodsorrel survives and sets seed even when mowed as close as 1/4 inch. After using a lawn mower where creeping woodsorrel grows, wash or air spray the machine to remove all seeds and clippings before mowing weed-free turf.

**Postemergent herbicides.** All postemergent herbicide applications are more effective when air temperatures are favorable for plant growth and not too hot or too cold. Be sure to follow label instructions and apply the herbicide uniformly over the entire lawn. Some of these products are active in the soil, as indicated on the label, so extra care is needed around shrub and tree roots growing in a lawn. Adding a surfactant (sometimes referred to as an herbicide helper) to the spray mixture, if indicated on the label, increases herbicide coverage and penetration by the leaf.

*Cool-season turfgrass (bentgrass, Kentucky bluegrass, tall fescue, and ryegrass).* Triclopyr and fluroxypyr are two postemergent broadleaf herbicides that are extremely effective in controlling seedling and established creeping woodsorrel plants in cool-season turfgrass lawns. Triclopyr is more readily available to the homeowner than fluroxypyr. These herbicides sometimes are sold in combination with other broadleaf herbicides.

**Table 1**

**Herbicides for Controlling Creeping Woodsorrel.**

| Herbicide | Commercial name | Available to home gardeners? |
|---|---|---|
| **Preemergents—apply before weeds emerge—for landscape plants and turf** | | |
| dithiopyr | Dimension | yes |
| isoxaben | Gallery, Portrait Broadleaf Weed Preventer | yes |
| oryzalin[1] | Surflan, Weed Impede | yes |
| oryzalin[1] + benefin | XL 2G, Amaze Grass & Weed Preventer 2, PrimeraOne OB–2G | yes |
| pendimethalin | Halts, Pendulum, PreM | yes |
| prodiamine | Barricade | no |
| **Postemergents—apply to young weeds—for use in turf only** | | |
| 2,4-D/2,4-DP/MCPP | Weed Whacker | yes |
| 2,4-D/MCPP/dicamba | Lawn Weed Killer, Trimec, Weed-B-Gon Lawn Weed Killer, Wipe-Out Broadleaf Weed Killer2, several others | yes |
| 2,4-D/MCPP/dicamba/ carfentrazone | Speed Zone | yes |
| fluroxypyr | Spotlight | no |
| triclopyr[2] | Clover & Oxalis Killer for Lawns, Turflon Ester, Weed-B-Gon Chickweed | yes |
| triclopyr/MCPA/ dicamba | Spurge Power, Weed-B-Gon Max Killer for Lawns | yes |
| **Nonselective postemergents—will kill turf or landscape plants** | | |
| glufosinate | Finale | yes |
| glyphosate | RoundUp | yes |

[1] Not safe for all turgrass species. Check the label.
[2] Not for use on bermudagrass and kikuugrass.

**Table 2**

**Herbicides for Bermuda Buttercup.[1]**

| Herbicide | Commercial Name | Available to home gardeners? | Comments |
|---|---|---|---|
| fluroxypyr | Spotlight | No | Selectively kills broadleaves. Not for use around broadleaf ornamentals or vegetables. |
| glufosinate | Finale | Yes | Nonselective. Will injure turf and ornamentals. |
| glyphosate | Round-Up | Yes | Nonselective. Will injure turf and ornamentals. |
| triclopyr | Clover and Oxalis Killer for Lawns, Turflon Ester, Weed-B-Gon Chickweed | Yes | Selectively kills broadleaves. Not for use around broadleaf ornamentals or vegetables or warm-season turf. |

[1] These postemergent materials will kill top growth but not bulbs.

The broadleaf weed herbicides 2,4-D, 2,4-DP, carfentrazone, dicamba, MCPA, and MCPP (mecoprop) sometimes are sold singly but more commonly are sold in 2-, 3-, and 4-way combinations of varying strengths. These materials are available at garden and landscape supply centers. Some combinations are specifically formulated for creeping woodsorrel and provide effective control. Alone, 2,4-D has limited effect on creeping woodsorrel. Often one application of triclopyr is adequate for control, but a follow-up application 3 to 6 weeks later might be necessary for complete control, and a second application is almost always needed for the other products discussed above.

*Warm-season turfgrass (bermudagrass, buffalograss, kikuyugrass, St. Augustinegrass, and zoysiagrass).* Triclopyr is harmful to bermudagrass and kikuygrass, so it isn't labeled for use in warm-season turfgrass lawns as a stand-alone herbicide. However, it has been formulated in a lower concentration and combined with other broadleaf herbicides (e.g. dicamba and MCPA) and is effective on creeping woodsorrel. Fluroxypyr, a similar chemistry to triclopyr, is safer to use in warm-season lawns and is very effective on creeping woodsorrel. Postemergent broadleaf herbicide combinations also are formulated for use in some warm-season turfgrasses. Several of these specifically target creeping woodsorrel and provide effective control.

**Preemergent herbicides for cool and warm-season turfgrasses.** Once established plants are under control, a preemergent application of dithiopyr, isoxaben, pendimethalin, or prodiamine will effectively prevent oxalis emergence. Oryzalin and oryzalin combined with benefin provide some preemergence activity on creeping woodsorrel. Oryzalin can't be used in all turfgrass species, so check the label for restrictions and carefully follow the directions for use. These materials are available at garden and landscape supply centers.

Preemergent herbicides can be applied any time of the year, and 3 applications per year might be necessary to reduce a heavy infestation and prevent creeping woodsorrel from establishing in lawns. Application timings of early fall, midwinter, and late spring are suggested.

## *Landscape Plantings*

Before planting in an infested area of either creeping woodsorrel or Bermuda buttercup, soil solarization—a method for killing weeds using a clear, plastic tarp and the sun's heat—can be used to reduce seed and bulb populations. To achieve the most effective results, perform solarization for a minimum of 4 consecutive weeks during June, July, or August. For more information, see *Soil Solarization for Gardens and Landscapes* listed in the References section.

**Creeping woodsorrel.** Control is difficult in areas with shrubs, herbaceous perennials, or groundcovers, particularly if established creeping woodsorrel plants aren't under control in other areas of the landscape. Total control of established woodsorrel and its seedlings is necessary in turfgrass, groundcovers, and bedding plants and around shrubs to prevent the weed from reestablishing. In severely infested areas it might be easier to start over and relandscape the site or parts of the landscape, salvaging as many ornamental plants as feasible or desirable. Prior to planting, use soil solarization or cultivate and sprinkle with water to germinate the seeds and then destroy the seedlings to reduce seed populations in the soil. You might need to repeat this process several times.

Carefully handweed oxalis around established plants to remove as much of the stem sections as possible, since they easily break. Several weedings usually are necessary to remove old plants, since new ones will grow from stem segments that remain in the soil. To reduce the chance of further infestation, remove the plants from the site to eliminate their seed, then apply a mulch, preemergent herbicide, or both to control seedlings.

Two types of mulching materials are effective—geotextile fabrics (landscape fabrics) and organic mulches used alone or on top of geotextile fabrics. When using organic mulches, cover the soil with 2 to 3 inches of mulch. If any light reaches the soil, seeds can germinate, or plant parts can regrow. If seeds drop on the soil between mulch pieces, they usually will germinate and grow; therefore, it is important to use a mulch size that is small enough to fill in most spaces on top of the soil but not so fine (e.g. sawdust) that the seeds will germinate on the mulch.

If you are using preemergent herbicides to control creeping woodsorrel, two applications about 8 weeks apart might be necessary to control all of the seedlings. Apply preemergents in the early fall, since this is when most seeds germinate.

Dithiopyr, isoxaben, oryzalin, pendimethalin, and prodiamine are available for commercial and homeowner use. Read herbicide labels carefully to determine if applications are safe around bedding plants. Be aware these herbicides also will inhibit germination of any ornamental seeds that are in the site. If using preemergents and mulches, first apply the herbicide, then lay the fabric or spread a thick layer of mulch. No selective postemergent herbicides are available to control creeping woodsorrel in ornamental plantings after the weed has emerged.

**Bermuda buttercup (Buttercup oxalis).** The best control method for this pernicious weed is prevention. If new infestations are spotted and controlled early, it is possible to eradicate small populations. Large populations are difficult to control and will require multiple years of diligent control efforts.

Small infestations can be controlled by repeated, manual removal of the entire plant. Repeated pulling of the tops will deplete the bulb's carbohydrate reserves, but these efforts will take years to be successful. Repeated mowing also will eventually deplete the bulb. Cut Bermuda buttercup before it flowers and forms new bulbs. Repeated cutting or cultivation is necessary to reduce

plant numbers. The soil from which plants are removed should be carefully examined or sifted to remove bulbs and bulblets, an extremely time- and labor-intensive process. Before planting in an infested area, use soil solarization to further reduce Bermuda buttercup populations.

Several postemergent herbicides including triclopyr and fluroxypyr (selective for broadleaf plants) and glyphosate and glufosinate (nonselective) effectively kill the top growth of this weed but are harmful to most ornamentals, so be careful these herbicides don't drift onto desirable plants. These herbicides don't kill the bulbs, and regrowth from bulbs should be expected.

Researchers around the world are investigating approaches for controlling Bermuda buttercup. Some suggest covering infestations with stiff cardboard, then covering the cardboard with a thick layer of organic mulch to kill the plants and weaken the bulbs, making them less capable of competing with desirable plants. Keep the mulch on the infestation until the mulch and cardboard have rotted, then plant competitive ornamentals into the soil-mulch mixture.

### *Container-grown Ornamentals*

Bermuda buttercup typically isn't a problem in container-grown ornamentals; however, creeping woodsorrel is a major problem. When planting new containers, use soil that is free of creeping woodsorrel seeds or Bermuda buttercup bulbs. When purchasing container plants from nurseries, avoid those with either species of *Oxalis* growing in the pots. If you find mature plants, carefully pull them out to remove all of the roots and/or bulbs. Fabric or organic mulches help prevent seed germination but have little effect on bulb germination.

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